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STUDIES ON AVIAN ANATOMY.—II.

*Geococcyx, Bubo and Aeronautes.**

MARGARET E. MARSHALL, M. A.

Introduction.

This paper is the second in a series dealing with the question of the homologies of the Caprimulgi. After a previous study of *Phalaenoptilus* (Proc. Amer. Phil. Soc., 1905) the writer has studied those forms most easily obtained, with which the Caprimulgi have been compared. They are: a cuckoo, *Geococcyx californianus* (Less.); an owl *Bubo virginianus palescens* (Stone), and a swift, *Aeronautes melanoleucus* (Baird). There was not time for the study of the entire anatomy of all the birds, so I have examined the alimentary tract, the central nervous system, the nostrils and pecten of the eye, the urogenital system, the musculature of the fore limb, and in *Geococcyx* the pterylosis.

The material used consisted of the following: two adult female *Aeronautes,* one entire, the other lacking a head; three adult female *Geococcyx,* two entire; and one entire adult female *Bubo.*

In order to obviate any misunderstanding in reading the descriptions which follow, an explanation of the terms there employed may not be amiss. In referring to the carina sterni the border designated "dorsal" is the line of junction between the carina and the body of the sternum, the latter being mentioned as the "lateral surface." The term "ventral," then, means the free border of the carina. The names of the crests, projections, and surfaces of the humerus are the same as those given by Furbringer (1888), Plate I, figures 9, 10, 11, 12. Also the name processus sterno-coracoideus is that given by him.

I wish to express my profound appreciation of the valuable assistance and ready sympathy of Professor Thos. H. Montgomery, Jr., under whose direction it has been my great pleasure to study for the past two years.

A. OBSERVATIONS.

1. Alimentary tract.

The tongue in *Geococcyx* (T., Pl. I., fig. 10) is long and slender. Posteriorly it is bifid and supplied with spines. In *Bubo* (T., Pl. IV.,

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fig. 34) it is broad and thick. It is also bifid posteriorly and covered thickly with spines. In *Aeronautes* (T., Pl. V., fig. 45) it is broad and thick, but is pointed anteriorly and slightly bifid. Posteriorly it is bifid and covered closely with spines.

The crop is absent in all. The duodenum in *Geococcyx* (Duo., Pl. I., fig. 13; Pl. II., figs. 21, 22) measures 12.3cm.; the small intestine (Pl. II., fig. 22), 28.9cm.; the terminal intestine (Pl. I., fig. 11; Pl. II., fig. 22), 10.4cm.; caeca (Cae., Pl. I., fig. 11; Pl. II., fig. 22), 6.1cm. In *Bubo* the measurement of the duodenum (Duo., Pl. III., figs. 24, 29) is 20.8cm.; the small intestine (Pl. III., fig. 29), 45.5cm.; terminal intestine (Pl. III., fig. 23), 7.5cm.; caeca (Cae., Pl. III., fig. 23), 8.2cm. In *Aeronautes* the measurement of the duodenum (Duo., Pl. V., figs. 47, 48, 49), is 13.1cm.; small intestine (Pl. V., fig. 49), 6.4cm. (this is from duodenum to beginning of the cloaca); terminal intestine (Pl. V., fig. 49), 1.8cm. In both *Geococcyx* and *Bubo* the caeca are enlarged at the tips. The type of the intestine in *Geococcyx* is a modification of the plagiocoel. In *Aeronautes* it is orthocoel.

The pancreas in *Geococcyx* (Pan., Pl. II., fig. 21), and *Aeronautes* (Pan., Pl. V., figs. 47, 48, 49), consists of two branches, one being situated in the duodenal loop and the other dorsal to it. There is one duct from each branch and in all cases they enter the ascending branch of the duodenal loop. In *Geococcyx* the entrance is posterior to the bending of the duodenum to pass under the right liver lobe, and in *Aeronautes* it is at the mid point of the ascending loop. The pancreas was not in a condition to be studied in *Bubo* (Pan., Pl. III., fig. 29).

A spleen is present in all the forms, and is situated on or near the junction of the proventriculus and the gizzard, at the right side. The organ is small in *Aeronautes* (Spl., Pl. V., fig. 48), but very large in *Geococcyx* (Spl., Pl. I., fig. 13), and *Bubo* (Spl., Pl. III., fig. 29). Its length in *Geococcyx* is 13mm., its average width 5mm. The length in *Bubo* is 25mm., the average width 10mm. The length in *Aeronautes* is 5mm., the average width 2mm.

The liver of *Geococcyx* (Liv., Pl. II., fig. 21) consists of two lobes, the right being fully one-third larger than the left. In *Bubo* (Liv., Pl. III., figs. 24, 29) the lobes are of almost equal size. In *Aeronautes* (Liv., Pl. V., figs. 47, 48, 49) the right lobe is a third larger than the left. On the dorsal border of the right lobe is a third lobe one-half the size of the left lobe.

A gall bladder is found under the lower border of the right liver lobe in all the birds. Its length in *Geococcyx* (G. bl., Pl. I., fig. 13) is 11mm., the average width is 4mm.; the length in *Bubo* (G.bl., Pl. III.,

fig. 24) is 26mm., the width 16mm.; in *Aeronautes* (G. bl., Pl. V., fig. 48) the length is 7mm., the width 4mm. The gall duct comes off from the anterior end of the gall bladder in *Geococcyx* and from the posterior end in both of the other birds. The gall ducts enter the ascending branch of the duodenum near the pancreatic and liver ducts.

The liver duct in *Geococcyx* (Liv. d., Pl. I., fig. 13) comes from the central surface of the right liver lobe, posterior to the bridge connecting the two lobes, and near the gall bladder. In enters the ascending branch of the duodenal loop posterior to the gall duct and between the pancreatic ducts. In *Bubo* (Liv. d., Pl. III., figs. 24, 29) the liver duct comes from the right side of the bridge and enters the duodenum anterior to the gall duct. In *Aeronautes* (Liv. d., Pl. V., fig. 48), about the middle of the right liver lobe comes off a liver duct which soon after leaving its surface receives a branch from the bridge connecting the two lobes. This duct then enters the ascending branch of the duodenal loop near the mid point of its dorsal surface behind the gall duct and anterior to the duct from the main branch of the pancreas.

2. Female Urogenital Organs.

The kidneys of *Geococcyx* (K., Pl. I., fig. 28) are not fused. Each consists of three distinct lobes varying slightly in size, and a small right adrenal. In *Bubo* (K., Pl. IV., fig. 32) the kidneys are not fused, and there is no distinct lobulation. In *Aeronautes* (K., Pl. VI., fig. 58) the two separate kidneys possess each two lobes of almost equal size, and there are two larger adrenals.

The ureters begin near the center of the kidney, between the anterior and middle lobes in *Geococcyx;* in *Bubo* near the anterior end of the kidney, and in *Aeronautes* near the posterior end between the two lobes. All enter the cloaca on its dorsal surface, and median to the entrance of the oviducts.

The left ovary and oviduct are well developed in *Geococcyx* (Ov., and L. Ovi., Pl. I., fig. 9). The ovaries are small in *Bubo* (Ov., Pl. IV., fig. 32) and *Aeronautes* (Ov., Pl. VI., fig. 58). The anterior portion of the oviduct was broken and could not be studied in *Bubo.* The infundibulum was too collapsed to make out in *Aeronautes.* In all the forms the right oviduct was represented by a blind sac. The bursa Fabricii (Bf., Pl. IV., fig. 32) was present only in *Bubo.*

3. Central Nervous System.

The brain of all these birds is compact, not elongated, as in *Phalenoptilus.* Only a small portion is exposed. The greatest length of the cerebrum in *Geococcyx* (Cer., Pl. I., figs. 1, 2, 3, 7)

is 18mm., the greatest width 13.25mm. In *Aeronautes* (Cer., Pl. V., figs. 38, 39, 40) the greatest length is 12mm., greatest width, 8.25mm.

The anterior-posterior measurement of the optic lobes in *Geococcyx* (Op. l., Pl. I., figs. 1, 2, 3) is 2mm., and the dorsal-ventral measurement is 4.25mm. In *Aeronautes* (Op. l., Pl. V., figs. 38, 39, 40) the anterior-posterior measurement is 1.125mm., the dorsal-ventral measurement is 2mm.

The length of the cerebellum in *Geococcyx* (Cb., Pl. I., figs. 1, 2, 3, 7) is 18.125mm., width from flocculus to flocculus is 12mm. The corresponding measurements in *Aeronautes* (Cb., Pl. V., figs. 38, 39, 40) are 11.5mm. and 7.75mm.

It was not possible to get the measurements of the brain of *Bubo* because of its torn condition.

All the cranial nerves of *Aeronautes* could not be identified on account of being broken.

The brachial plexus is made up of four nerve roots in *Geococcyx* (Pl. I., fig. 7a), four in Bubo (Pl. IV., fig. 31), and five in *Aeronautes* (Pl. V., fig. 41). The branching and anastomosing is most complex in *Aeronautes* and simplest in *Bubo.*

The sacral plexus consists of seven nerve roots in *Geococcyx* (Pl. I., fig. 4) and of five in *Aeronautes* (Pl. V., fig. 46), most complex in the former. The spinal cord was too broken for it to be studied in *Bubo.*

4. Special Sense Organs.

The nostrils in *Geococcyx* (Nos., Pl. I., fig. 2) are median, inferior and oblong. The internal nares (I. n., Pl. I., fig. 12) is a single median club-shaped opening. These organs were not studied in *Bubo.* The nostrils in *Aeronautes* (Nos., Pl. V., fig. 38) are tubular, and larger near the opening than elsewhere. The internal nares (I. n., Pl. V., fig. 44) is a very long, median, irregular slit.

The pecten of the eye in *Geococcyx* (Pl. I., figs. 5, 6) consists of sixteen folds. It measures in height 4mm., and its basal breadth is 7.25mm. In *Bubo* (Pl. IV., figs. 35, 36) it consists of eight folds. The corresponding measurements are 7.125mm. and 6.125mm. In *Aeronautes* (Pl. V., figs. 42, 43) there are fourteen folds. The corresponding measurements are 3mm. and 5mm. In all cases the pecten is heavily pigmented.

5. Myology.

a. Pectoral Muscles.

1. M. pectoralis.—Pars thoracia. The origin in *Geococcyx* (Pect., Pl. II., figs. 14, 17) is on the clavicle, the ventral third of the anterior half of the carina sterni, all its posterior portion and

the posterior three-fourths of the lateral surface of the sternum. It inserts on the ventral surface of the erista lateralis of the humerus, and sends down a tendinous slip to fuse with the tendon of the bieeps, running over the tuberculum mediale. The origin in *Bubo* (Peet., Pl. IV., figs. 30, 37) is on the clavicle, interclavicular membrane, earina sterni, exeept the dorsal third of its anterior portion, and from the posterior three-fourths of the lateral surfaee of the sternum. It inserts fleshily on the erista lateralis, and fuses with the biceps tendon above the tubereulum mediale. The origin in *Aeronautes* (Pect., Pl. VI., figs. 50, 53, 55) is on the clavicle, the interclavicular membrane, the ventral half of the earina sterni, and from the posterior lateral third of the sternum. It inserts on the crista lateralis and on the tuberculum mediale.

Pars propatagialis. See M. Propatagialis.

Pars abdominalis. This muscle is absent in *Geococcyx*. In *Bubo* (Ab., Pl. IV., figs. 30, 37) the origin eould not be made out on aecount of the torn condition of the bird. At its insertion it is fused with the pars thoraeica on the tendon of the bieeps. In *Aeronautes* (Ab., Pl. VI., fig. 50) the origin could not be made out. It is fused at its insertion with the pars thoracica on the crista lateralis of the humerus.

2. M. supraeoracoideus. Origin in *Geococcyx* (Sup. eor., Pl. II., fig. 16) is on the interclavicular membrane, dorsal two-thirds of the anterior part of the carina sterni, and from the anterior one-fourth of the sternum. It inserts on the ventral surface of the tuberculum laterale of the humerus. Origin in *Bubo* (Sup. eor., Pl. III., fig. 25; Pl. IV., fig. 30) is on the dorsal border of the interelavieular membrane, anterior dorsal third of the carina sterni, and on the anterior one-fourth of the sternum. It inserts on the humerus anterior to the erista lateralis on the ventral surfaee of the tubereulum laterale of the humerus. Origin in *Aeronautes* (Sup. eor., Pl. VI., figs. 51, 56) is on the dorsal half of the interclavicular membrane, half the carina sterni, and anterior two-thirds of the lateral surfaee of the sternum. It inserts on the humerus anterior to the erista lateralis on the dorsal surface of the tubereulum laterale of the humerus.

3. M. eoraeo-brachialis posterior. Origin in *Geococcyx* (Cor.-b. p., Pl. II., figs. 16, 20) is on the posterior two-thirds of the lateral border and dorsal surface of the eoracoid. It inserts on the distal end of the apex tubereuli medialis humeri. Origin in *Bubo* (Cor.-b. p., Pl. III., figs. 25, 28) is on the posterior lateral half of the eoraeoid and has a broad tendinous extension down to the fourth sternal rib. It inserts on the distal end of the apex tubereuli medialis

humeri. Origin in *Aeronautes* (Cor.-br. p., Pl. VI., figs. 51, 56) is on the posterior lateral half of the coracoid, its dorsal surface, and from neighboring border of the sternum. It inserts on the distal end of the apex tuberculi medialis humeri.

4. M. coraco-brachialis anterior. Origin in *Geococcyx* (Cor.-b. a., Pl. II., figs. 16, 17) is fleshy on the lateral border of the anterior end of the coracoid. It inserts also fleshily on the ventral surface of the humerus, reaching the crista lateralis. Origin in *Bubo* (Cor.-br. a., Pl. IV., fig. 30) is semitendinous on the lateral surface of the anterior end of the coracoid. It inserts fleshily on the lateral border and ventral surface of its humerus, not only reaching the crista lateralis, but sending a slender extension down the humeral shaft beside the M. pars humero-cubitalis for one-fourth the length of the humerus. Origin in *Aeronautes* (Cor.-br. a., Pl. VI., figs. 55, 56) is semitendinous on the lateral surface of the anterior end of the coracoid. It inserts on the lateral border of the humerus and on the ventral surface extending down to the base of the insertion of M. pars thoracica.

b. Other trunk muscles inserting on wing, scapula and coracoid.

1. M. deltoideus major. Origin in *Geococcyx* (Del., Pl. II., figs. 14, 15, 16, 17, 19) is semitendinous on the dorso-median border, and on less than the proximal fourth of the dorsal surface of the scapula, extending even to the anterior end of the same and on the dorsal surface entering the foramen triosseum. It inserts on the os humero-scapulare, entire dorsal surface of the humeral head, and on the crista lateralis, terminating on the lateral surface of the humerus two-thirds of its length from the head. Origin in *Bubo* (Del., Pl. III., figs. 26, 28; Pl. IV., fig. 33) is on the anterior dorsal surface of the scapula not quite reaching the extremity, but extends to the dorso-median border and into the foramen triosseum. It inserts on the os humero-scapulare, dorsal surface of the crista lateralis, and down to the mid point of the lateral surface of the humerus. Origin in *Aeronautes* (Del., Pl. VI., figs. 52, 56), is on the dorso-median border of the anterior end of the scapula, scapular facing border of the coracoid, and dorsal extremity of the clavicle. It inserts fleshily on the processus supra-condyloideus lateralis of the humerus.

2. M. deltoideus minor. Origin in *Geococcyx* (Del. m., Pl. II., fig. 17) is on the coracoid facing surface of the anterior end of the scapula, ligamentum coraco-scapulare dorsale. The fibers on its lower surface are fused to those of the M. deltoideus major lying under it, but the muscle lies mainly in front of the M. deltoideus major.

It crosses over the humeral head in front of the os humero-scapulare, and inserts tendinously on the tuberculum laterale of the humerus. Origin in *Bubo* (Del. m., Pl. III., fig. 26; Pl. IV., fig. 30) is from the clavicle facing surface of the coracoid and from the clavicle. Its fibres fuse with the underlying portion of the M. deltoideus major, coming from the foramen triosseum, but it lies mainly in front of that muscle. It crosses the humeral head in front of the os humero-scapulare and is inserted on the tuberculum laterale of the humerus, continuing down the crista lateralis to the insertion of the M. pars thoracica. Origin in *Aeronautes* (Del. m., Pl. IV., fig. 56) the anterior one of the two bundles is from the coracoid facing surface of the scapula and the ligament coraco-scapulare dorsale. It inserts at the base of the crista lateralis of the humerus, anterior to the tendon of the M. supra coracoideus. The origin of the posterior one is on the dorsal surface of the scapula immediately following the first. It inserts at the base of the crista lateralis of the humerus posterior to the tendon of the M. supra-coracoideus. Both bundles are almost covered by the M. deltoideus major, but with its fibres they do not fuse.

3. M. latissimus dorsi. In all the birds this consists of two portions.

M. latissimus dorsi anterior. Origin in *Geococcyx* (Lat. d. a., Pl. II., figs. 15, 19) is fleshy on the posterior part of the first dorsal vertebra, second, third, and part of the fourth. It inserts by a thin tendon on the dorsal surface of the humerus at the base of the M. deltoideus major near the mid point of its insertion. Origin in *Bubo* (Lat. d. a., Pl. III., figs 26, 28; Pl. IV., fig. 33) is on the second and the third dorsal vertebrae. It is inserted tendinously on the dorsal surface of the humerus at the base of the M. deltoideus major. Origin in *Aeronautes* (Lat. d. a., Pl. VI., figs. 52, 54) is tendinous on the second, third, and part of the fourth dorsal vertebrae. It is inserted fleshily on the dorsal surface of the humerus at the base of the posterior bundle of the M. deltoideus minor.

M. latissimus dorsi posterior. Origin in *Geococyx* (Lat. d. p., Pl. II., figs. 15, 20) is semitendinous from dorsal vertebrae following the fourth and tendinously from the anterior border of the ilium. It is inserted semitendinously on the dorsal surface of the humerus between the short heads of the M. pars humero-cubitalis at the beginning of their union. Origin in *Bubo* (Lat. d. p., Pl. III., figs. 26, 28; Pl. IV., fig. 33) is tendinous on the anterior border of the ilium, and has fascia connection with the M. rhomboideus superficialis. Its fibers are fused with those of the M. latissimus dorsi anterior as it passes under that muscle, but it emerges from under

the anterior border separate and tendinous, to be inserted immediately anterior to the M. latissimus dorsi anterior. The two muscles are connected by a heavy fascia which extends from the posterior border of the anterior bundle to the mid point of the posterior one, and continues to their insertion. Origin in *Aeronautes* (Lat. d. p., Pl. VI., figs. 52, 54) is tendinous from part of the fourth and the following dorsal vertebrae, and the anterior border of the ilium. It is inserted immediately anterior to one of the short heads, and between it and the other, which comes from the foramen triosseum. The line of separation is not distinct between the two muscle bundles, and they become clearly separate only near their insertions.

4. M. rhomboideus superficialis. In *Geococcyx* (Rh. s., Pl. II., figs. 15, 19) it consists of two portions connected by fascia. Its origin is semitendinous from the two last cervical vertebrae, and the following dorsal ones. It is inserted fleshily on the anterior four-fifths of the dorso-median border of the scapula. Origin in *Bubo* (Rh. s., Pl. III., fig. 26; Pl. IV., fig. 33) is tendinous from the second and following dorsal vertebrae, and from the anterior edge of the ilium. It is inserted fleshily on the entire dorso-median border of the scapula. Origin in *Aeronautes* (Rh. s., Pl. VI., figs. 52, 56) is fleshy from part of the last cervical and following four dorsal vertebrae. It is inserted fleshily on the anterior half of the dorso-median border of the scapula.

5. M. rhomboideus profundus. Origin in *Geococcyx* (Rh. p., Pl. II.; fig. 19) is semitendinous from the last cervical vertebra, the first, second, third and part of the fourth dorsal vertebrae. It inserts fleshily on the posterior dorso-median half of the scapula. Origin in *Bubo* (Rh. p., Pl. III., fig. 26; Pl. IV., fig. 33) is fleshy from second, third, fourth, fifth, and part of the sixth dorsal vertebrae. It inserts fleshily on the dorso-median border of the posterior two-thirds of the scapula. Origin in *Aeronautes* (Rh. p., Pl. VI., fig. 56) is tendinous from the dorsal vertebrae following the fourth. It inserts fleshily on the posterior one-third of the dorso-median border of the scapula.

6. M. scapuli-humeralis anterior. Origin in *Geococcyx* (Sc.-hu. a., Pl. II., figs. 18, 19, 20) is fleshy on the dorsal surface of scapula between the M. rhomboideus superficialis and the M. subscapularis, beginning at the anterior edge of the M. scapuli-humeralis posterior and extending to the M. pars scapuli-cubitalis. It inserts fleshily between the short heads of the M. pars humero-cubitalis anterior to the insertion of the M. latissimus dorsi posterior, and reaching the foramen pneumaticum. In *Bubo* this muscle is absent. Origin in *Aeronautes* (Sc.-hu. a., Pl. VI., figs. 51, 54, 56) is fleshy on dorso-

lateral border of the scapula, extending from the anterior border of the M. subscapularis to the M. pars scapuli-cubitalis. It inserts fleshily on the dorsal surface of the humerus between the short heads of the M. pars humero-cubitalis, anterior to the insertion of the M. latissimus dorsi posterior, extending to the border of the foramen pneumaticum.

7. M. scapuli-humeralis posterior. Origin in *Geococcyx* (Sc-hu. p., Pl. II., figs. 15, 19, 20) is fleshy from the posterior three-fourths of the dorsal and lateral surface of the scapula. It inserts by a strong tendon within the border of the tuberculum mediale of the humerus between the long and short heads of the M. pars humero-cubitalis. Origin in *Bubo* (Sc.-hu. p., Pl. III., figs. 25, 26, 28; Pl. IV., fig. 33) is fleshy from the posterior half of the lateral surface of the scapula. It inserts by a strong tendon within the border of the tuberculum mediale of the humerus between two heads of the M. pars humero-cubitalis. Origin in *Aeronautes* (Sc.-hu. p., Pl. VI., figs. 51, 52, 54, 56) is fleshy from the posterior half of the lateral surface of the scapula. It inserts by a short, round tendon within the border of the tuberculum mediale of the humerus between the heads of the M. pars humero-cubitalis.

8. M. subscapularis. Origin in *Geococcyx* (S. sc., Pl. II., figs. 18, 20) is fleshy, and anterior to the M. scapuli-humeralis posterior on the lateral and median surfaces of the scapula. It inserts tendinously on the apex tuberculi medialis humeri, anterior to the insertion of the M. coraco-brachialis posterior. Origin in *Bubo* (S. sc., Pl. III., figs. 25, 26, 28) is fleshy and anterior to the m. scapuli-humeralis posterior on the lateral and median surfaces of the scapula. It inserts by a strong tendon on the apex tuberculi medialis humeri, anterior to the insertion of the m. coraco-brachialis posterior. Origin in *Aeronautes* (S. sc., Pl. VI., figs. 51, 52, 56) is fleshy, and anterior to the m. scapuli-humeralis posterior from the lateral and median surfaces of the scapula. It inserts tendinously on the apex tuberculi medialis humeri, anterior to the insertion of the m. coraco-brachialis posterior.

9. M. serratus superficialis anterior. Origin in *Geococcyx* (Ser. s. a., Pl. II., fig. 18) is fleshy on the anterior border of the second free rib betwen its processus uncinatus and the tip. It inserts tendinously on the ventral border of the scapula dividing the m. subscapularis into a small M. subscapularis externus and a larger m. subscapularis internus. Origin in *Bubo* (Ser. s. a., Pl. III., fig. 25) is fleshy on the first sternal rib, with a small slip from the second. It inserts tendinously on the ventral border of the scapula dividing m. subscapularis into a small m. subscapularis externus and a large

m. subscapularis internus. Origin in *Aeronautes* (Ser. s. a., Pl. VI., fig. 51) is fleshy on the anterior border of the free rib and its processus uncinatus and from the corresponding portion of the first sternal rib. It inserts tendinously on the ventral border of the scapula dividing the m. subscapularis into a large m. subscapularis externus and a small m. subscapularis internus.

10. M. serratus superficialis posterior. Origin in *Geococcyx* (Ser. s. p., Pl. II., fig. 18) is fleshy, in three scallops, the posterior border of the second free rib, first and second sternal ribs, and their processus uncinati. The insertion on the ventro-median border of the scapula is tendinous except at the tip of that bone. This tendinous sheet is continuous with the posterior border of the anterior part of this muscle. Origin in *Bubo* (Ser. s. p., Pl. III., fig. 25) is fleshy in four teeth from the second, third and fourth sternal ribs and their processus uncinati. The insertion on the ventro-median border of the scapula is tendinous except at the tip of that bone, where it becomes fleshy. This tendinous sheet is continuous with the posterior border of the anterior muscle bundle. Origin in *Aeronautes* (Ser. s. p., Pl. VI., fig. 51) is fleshy in four teeth from the second, third and fourth ribs and their processes uncinati. It inserts fleshily on the ventro-median border of the last fifth of the scapula.

11. M. serratus profundus. In *Geococcyx* (Ser. p., Pl. II., fig. 18) it consists of three portions. The first bundle arises from the transverse process of that cervical vertebra preceding the last, and aponeurotically from the muscles of that region, the second from the process of the last cervical vertebra, the third partly from the process of the last cervical vertebra, but mainly from the first short rib, the upper half. They insert on the posterior two-thirds of the median surface of the scapula. In *Bubo* (Ser. p., Pl. III., fig. 25) it consists of two bundles. The first comes from the transverse process of the first dorsal vertebra and the contiguous portion of the free rib; the second from the first sternal rib near its dorsal articulation, dorsal surfaces of third and fourth ribs, and from the intercostal spaces. Both bundles insert on the posterior median surface of the scapula, less than half. In *Aeronautes* (Ser. p., Pl. VI., fig. 51) it consists of two bundles. The first portion coming from the posterior border of the free rib from its dorsal articulation, down almost to the processus uncinatus; the second from the posterior border of the first sternal rib and its process uncinatus. The two portions insert on the middle third of the median surface of the scapula.

12. M. sterno-coracoideus. Origin in *Geococcyx* (St.-co., Pl. II.,

fig. 18) is on the first and second sternal ribs. It inserts on the posterior border of the processus sterno-coracoideus. Origin in *Bubo* (St.-co., Pl. III., fig. 25) is on the first five sternal ribs. It inserts on the outer surface of the processus sterno-coracoideus, runs anteriorly close to the base of the coraco-brachialis posterior to the posterior third of the median surface of the coracoid. Origin in *Aeronautes* (St.-co., Pl. VI., fig. 51) is on the first, second and third sternal ribs. It inserts on the posterior border of the processus sterno-coracoideus.

13. M. subcoracoideus. In *Geococcyx* (Sub. co., Pl. II., figs. 16, 18, 20) the muscle consists of two parts. A fan-shaped division arises from the dorsal fourth of the median surface of the clavicle and partly from the anterior end of the scapula. The long, narrow portion comes from the middle third of the median surface of the coracoid, contiguous to the anterior border of the m. coraco-brachialis posterior, and from the neighboring surface of the interclavicular membrane. The two portions unite just before their insertion, which is tendinous, on the apex tuberculi medialis humeri, anterior to the insertion of the m. coraco-brachialis posterior, and ventral to that of the m. subscapularis. In *Bubo* (Sub. co., Pl. III., figs. 25, 28) it consists of two portions of almost equal size. One division comes equally from the neighboring median surfaces of the coracoid and scapula, with some fibres from the clavicle. The other part comes from the middle third of the median surface of the coracoid. They unite just before their tendinous insertion on the apex tuberculi medialis humeri, anterior to the insertion of the m. coraco-brachialis posterior and ventral to that of the m. subscapularis. In *Aeronautes* (Sub. co., Pl. VI., figs. 51, 55) it also consists of two portions, of almost equal size. One part arises from less than a fourth of the anterior median surface of the scapula, the other from the middle third of the median surface of the coracoid. The two bundles fuse as they bend under the scapula and are inserted tendinously on the apex tuberculi medialis humeri, anterior to the insertion of the m. coraco-brachialis posterior, and ventral to that of the m. subscapularis.

c. Muscles restricted to the wing.

1. M. propatagialis. This muscle, described by Gadow (1891) on page 253, seems to me almost identical with that of m. pectoralis pars propatagialis, described by him on page 245.

Pars propatagialis musculi deltoidei. In *Geococcyx* the two muscles have a common origin on the dorso-median surface of the clavicle and the neighboring anterior end of the coracoid. They become separated only in the distal third of the fleshy mass.

a. M. propatagialis longus (P. pat. l., Pl. II., figs. 14, 15) runs along in the anterior margin of the patagium and fuses with the inner surface of the skin covering the os magnum. In *Bubo* (P. pat. l., Pl. IV., figs. 33, 37) the two muscles are quite separated at the origin. The fibres of the longus are proximally not distinguishable from those of the m. pars thoracica. The fleshy portion become tendinous at the crista lateralis of the humerus and is fused with the skin covering the distal end of the radius. In *Aeronautes* (P. pat. l., Pl. VI., figs. 50, 52, 57) the two muscles are entirely separated. The longus consists of two distinct portions, one coming from the second dorsal fifth of the clavicle, the ventral and large one from the middle third of the clavicle. The two fuse in the distal third of their fleshy bundles and continue in a common tendon to the os magnum, where it becomes split, one division being inserted on the ventral proximal border of the pollex digit, and the other near the mid point of the pollex digit on the dorsal surface.

b. M. propatagialis brevis. In *Geococcyx* (P. pat. b., Pl. II., figs. 14, 15, 17) the main part of the tendon is inserted on the m. extensor metacarpi ulnaris (radialis?), one-fourth the length of the fleshy portion of the muscle from its origin. From this point a branch is sent to the patagium and there fades out in a fan-like expansion. The other passes over into the heavy fascia extending from the anterior border of the radius down to the feathers. In *Bubo* (P. pat. b., Pl. IV., figs. 33, 37) the brevis comes semitendinously from the dorso-median surface of the clavicle and from the anterior end of the scapula. At its lower corner it is fused to the m. deltoideus major. From its chest-facing surface comes off a strong fascia which passes over the crista lateralis of the humerus and fades out into the m. pars thoracica at the base of the longus. From its distal end come off two strong tendons. The anterior one bifurcates half way to the fore arm. The anterior fork fuses with the tendon of the m. extensor metacarpi culnaris (radialis?), the other one crosses this muscle and continues distally, losing itself in the heavy fascia extending from the anterior border of the radius down to the feathers. The posterior tendon goes direct to the m. extensor metacarpi uluaris (radialis?), proximal to the fork of the anterior tendon, and fuses with it. At the point where the brevis becomes tendinous there is a short tendinous band coming off from its under surface and inserting on the crista lateralis of the humerus. In *Aeronautes* (P. pat. b., Pl. VI., figs. 52, 57) the brevis comes off from the dorsal end of the coracoid. It continues fleshily to the m. extensor metacarpi ulnaris (radialis?), and except at its lower edge, fuses with this muscle. From this edge comes off a short

tendon, which merges into the upper distal corner of the m. deltoideus major.

2. M. metapatagialis. In *Geococcyx* (Met., Pl. II., fig. 15) it consists of two narrow bands. The dorsal one comes from the facing ends of the spines of the two dorsal vertebrae preceding the last. It is inserted on the skin above the m. pars humero-cubitalis somewhat proximal to the mid point of the humerus, the insertion is at the base of the humeral feather tracts. The ventral one comes from the anterior border of the first sternal rib near its articulation with the ventral segment. It meets and fuses with the dorsal band at its insertion. In *Bubo* (Met., Pl. III., fig. 25; Pl. IV., fig. 33) the narrow dorsal band arises from the anterior dorsal border of the ilium, and inserts on the skin a little proximal to the mid point of the humerus. The ventral portion is much broader. It has its origin in two scallops on the fourth and fifth sternal ribs, and fuses with the insertion of the dorsal branch. In *Aeronautes* (Met., Pl. VI., fig. 51) only the ventral band was present. It comes from the third and fourth sternal ribs at the base of their processus uncinati.

3. M. biceps brachii. In *Geococcyx* (Bi., Pl. II., figs. 14, 16) it has a tendinous origin on the antero-lateral surface of the coracoid, and on the tuberculum mediale of the humerus. It inserts by two short tendons on facing surfaces of ulna and radius just beyond the proximal border. In *Bubo* (Bi., Pl. IV., figs. 30, 37) the origin is tendinous on the anterior lateral surface of the coracoid and on the tuberculum mediale of the humerus. It inserts by two tendons on facing surfaces of ulna and radius beyond the proximal border. In *Aeronautes* (Bi., Pl. VI., fig. 53) it arises by one long tendon from the lateral border of the anterior end of the coracoid. It inserts by one delicate tendon on the ulna facing surface of the radius.

Pars propatagialis m. bicipitis was absent in all the birds.

4. Triceps cubiti. In all the birds this consists of two separate parts, one m. pars scapuli-cubitalis, and two m. humero-cubitales.

a. Pars scapuli-cubitalis. Origin in *Geococcyx* (Pars. sc. cub., Pl. II., figs. 15, 19, 20) is semitendinous on the neck of the scapula, and the outer surface of the glenoid fossa. It inserts on the ulna between the olecranon process and the external condyle. In *Bubo* (Pars. sc. cub., Pl. III., figs. 26, 28) the origin is semitendinous on the neck of the scapula. As the muscle passes over the m. latissimus dorsi anterior it gives off a strong flat tendon which passes to the humerus anterior to the m. latissimus dorsi anterior, and fuses with the small tendon of the m. latissimus dorsi posterior. It inserts by a broad tendon beyond the proximal rim of the external

condyle of the ulna. From this point there comes off a tendon which bends back around the external condyle of the humerus and inserts on the processus supracondyloideus lateralis of the humerus. Origin in *Aeronautes* (Pars. sc. cub., Pl. VI., figs. 52, 54) is semitendinous on the neck of the scapula, and outer glenoid border. In inserts by a short, strong tendon on the proximal rim of the external condyle of the ulna.

b. Pars humero-cubitalis. In *Geococcyx* (Pars. hu. cnb., Pl. II., figs. 14, 20) the short head comes from the distal four-fifths of the median surface of the humerus. The other part, divided at its origin by the insertion of the m. scapuli-humeralis posterior, comes from the crista medialis of the humerus and from the margin of the foramen pneumaticum. The parts soon unite and run down to insert by a tendon and a strong aponeurosis on the olecranon process of the ulna, and on the intervening space between it and the external condyle. In *Bubo* (Pars. hu. cub., Pl. III., fig. 28; Pl. IV., figs. 33, 37) one part comes from the median surface of the humerus, and the other, divided at its origin by the insertion of the m. scapuli-humeralis posterior, comes from the crista medialis of the humerns and from within the foramen pneumaticum. Insertion is by tendon and a strong aponemosis on the olecranon process of the ulna and the intervening space between it and the external condyle. In *Aeronautes* (Pars. hu. cub., Pl. VI., fig. 54) one part comes from the median surface of the humerus, and the other, divided at its origin by the m. scapuli humeralis posterior, from the crista medialis of the humerus, and from the rim of the foramen pneumaticum. Its insertion is by a tendon and an aponeurosis on the olecranon process of the ulna and the external condyle.

During the preparation of the present paper errors in my study on *Phalaenoptilus* were discovered. The corrections are given below.

The muscle named M. deltoideus major anterior is the m. deltoideus minor. M. rhomboideus superficialis inserts on the anterior four-fifths of the dorso-median border of the scapula. M. rhomboideus profundus has a tendinous origin on the last cervical and the following dorsal vertebrae, and also from the anterior edge of the ilium. M.scapuli-humeralis posterior inserts within the border of the tuberculum mediale of the humerus, near, but not within the foramen pneumaticum. M. subscapularis arises from the lateral and median surfaces of the scapula. It inserts by a short tendon on the apex tuberculi medialis humeri anterior to the insertion of the m. coraco-brachialis posterior. M. serratus superficialis posterior arises in four scallops from the four sternal ribs. There is a fleshy insertion of a part of the muscle on the posterior tip of the scapula,

and a faseia connection between this and the posterior border of the m. serratus superficialis anterior, which is inserted on the scapula. *M. serratus profundus* consists of three portions. The dorsal bundle comes from the free rib at the end of the transverse process; the second from the same rib lower down and from its posterior border; the third from the posterior border of the following rib. *M subcoracoideus* arises on the middle third of the median surface of the coraeoid, aponeurotically from the muscles of that region, partially from the neighboring portion of the clavicle. It inserts on the apex tuberculi medialis humeri, anterior to the insertion of the m. coraeobraehialis posterior and ventral to the m. subscapularis. The muscle designated *E* is the m. coracobrachialis anterior. It arises from the lateral anterior end of the coracoid. It inserts on the lateral border and on the ventral surface of the humerus, extending down to the anterior border of the crista lateralis of the humerus.

VI. *Pterylosis of Geococcyx.*

(Plate VII.)

The dorsal head feathering begins as a single row median to each nostril, then broadens to cover the fore part of the head, becoming a single median row back of the eyes. With the two parallel rows which arise above each eye it forms a narrow band of five rows, which runs back to the base of the head. The tract is fairly dense on the side of the head. Around the ear is a circle of feathers formed partly by the lower one of the two rows arising in front of the eye. Below the ear the rows run obliquely downward and upward to join, respectively, the ventral and dorsal tracts. The feathering of the infra-mandibular region consists of a narrow median band which is divided in its posterior half. The chin and throat are occupied by rows of feathers running obliquely from the median line out to the side of the neck where they terminate. The ventral cervical tract becomes strong toward the base of the neck. The dorsal tract is a broad band at its origin on the nape of the neck, and narrows gradually to end abruptly between the shoulder blades. It is renewed on each side of this break by a single row which soon becomes strong, and then divides to enclose an elliptical apterion. Uniting again it reaches its greatest expansion between the insertion of the femora, then gradually diminishes and terminates near the base of the oil gland. The strong humeral tract is continuous with the ventral one. On the dorsal surface of the wing is a wide tract covering almost the en-

tire surface of the patagium and extending to the posterior border of the ulna. There is a narrow band along the posterior border of the humerus. The alula bears six strong feathers which extend from its distal extremity around its posterior border to the base. Beginning at the base the feathers increase in length successively till the sixth is reached which is the shortest of all, the fifth being the longest. Along the anterior margin occur contour feathers. There are ten primaries which become successively shorter from the wrist to the hand. There are twelve secondaries, and the wing is quin-cubital. The strong femoral tract runs into the dorsal tract, and grows weak as it crosses to the knee. The dorsal surface of the thigh is sparsely covered. The feathering of the leg extends to the heel and is not dense except along the posterior and anterior borders.

The ventral tract merges anteriorly with the lower cervical and the humeral tracts. Near the clavicle two rows median to the main tract separate from it, and continue to the small tract in front of the anus, where it is joined by a single row which comes from the extremity of the main tract. On the ventral surface of the wing the feathers are distributed along the margins, over the alula and between the patagium and the ulna. The crural tract consists of a narrow band along the posterior edge of the leg down to the heel, but not reaching the ventral tract. At the anterior border of the leg it is joined to the ventral tract, and along this border is fairly dense. From this rows extend out to near the middle of the leg.

There are ten rectrices. On the dorsal surface there are five coverts. On the ventral only four were found. At the base of the oil gland is a semicircle of six small feathers. On the ventral surface there is a dense tract on each side of the tail. The anus is almost surrounded by a small tract.

B. *Conclusions.*

The following comparisons are limited to the genera described in this paper and to *Phalacnoptilus* treated in my previous one, partly because much of the literature on this subject was inaccessible, but mainly because I desired to limit the comparisons to genera personally examined.

In the myology there are some exact agreements and many close resemblances. All the birds agree in the presence of an oil gland, a spleen and a gall bladder; in the absence of the biceps slip and powder downs; in the number of pancreatic branches and ducts. Characters which show differences are given in the following table.

	Number of Liver Lobes	Number of Liver Ducts	Number of Caeca	KIDNEYS: Right and Left Kidney Fused	KIDNEYS: Right and Left Kidney not Fused	KIDNEYS: Number of Lobes of Right Kidney	KIDNEYS: Number of Lobes of Left Kidney	KIDNEYS: Number of Adrenals	Number of Nerves in Brachial Plexus	Number of Nerves in Sacral Plexus	Number of Primaries	Number of Secondaries	Number of Rectrices	Number of Phalanges of Last Toe	Middle Toe Serrated	Syrinx	Sternum	YOUNG: With Down	YOUNG: Without Down
Geocaccyx	2	1	2	---	x	3	3	1	4	7	10	12	10	5	---	Bronchial	Two Notches		x
Bubo	2	1	2	---	x	---	---	---	4		11	15	12	5	---	"	"	x	
Aeronautes	3	2	---	---	x	2	2	2	5	5	10	8-11	10	3	---	Leaches	-----		x
																Bronchial			
Phalaenoptilus	2	1	2	x	---	3	2	---	3		10	12	10	4	x	"	One Notch	x	

It appears from comparison of the structures mentioned that *Phalaenoptilus* and *Aeronautes* go together, and *Bubo* and *Geococcyx*. The relation, however, is less close between the two former than between the two latter. The question of the relationship of the Caprimulgi, however, is not one to be settled by the examination of a few genera, but requires a more careful and thorough investigation of many related forms than has yet been made.

It is interesting to note here that *Phalaenoptilus* is probably the most primitive of these four genera. The elongated brain and its relatively small size compared with the head, the fairly well developed right oviduct, and the downy plumage of the young are facts which indicate it as the most primitive.

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(Exclusive of the Osteology.)

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Description of the Plates.

The following abbreviations have been employed:
Ab., Musculus pectoralis, pars abdominalis.
A. C., Anterior commissure.
Ad., Adrenal.
Ap. tb. m., Apex tuberculi medialis humeri.
Bf., Bursa Fabricii.
Bi., Musculus biceps brachii.
C., Coracoid.
Cae., Caeca.
Cb., Cerebellum.
Cer., Cerebrum.
Cj., Conjunction of Duodenum and Gizzard.
Cl., Clavicle.
Clo., Cloaca.
Con., Processus supracondyloideus lateralis of the humerus.
Cor. br. a., Musculus Coraco-brachialis anterior.
Cor. br. ai., M. coraco-brachialis anterior insertion.

Cor. br. p., M. coraco-brachialis posterior.
Cor. br. pi., M. coraco-brachialis posterior insertion.
Del., M. deltoideus major.
Deli., M. deltoideus major insertion.
Del. m., M. deltoideus minor.
Del. mi., M. deltoideus minor insertion.
Duo., Duodenum.
E., Eye.
Eu., Aperture of Eustachian tube.
Ext. met. ul. r., Musculus extensor metacarpi ulnaris (radialis?).
Ext. met. ul. ri., Musculus extensor metacarpi ulnaris radialis, insertion.
F., Funnel shaped opening of oviduct into coelome.
F. pn., Foramen pneumaticum.
G., Glottis.
G. bl., Gall bladder.
Giz., Gizzard.
Gl. d., Gall duct.
Ht., Heart.
Hu., Humerus.
Hu. sc., os humero-scapulare.
Hy., Hypophysis.
Il., Ilium.
In., Infundibulum.
I. n., Internal nares.
Int., Intestine.
K., Kidney.
Lat. d. a., Musculus latissimus dorsi anterior.
Lat. d. ai., Musculus latissimus dorsi anterior insertion.
Lat. d. p., M. latissimus dorsi posterior.
Lat. d. pi., M. latissimus dorsi posterior insertion.
Lig. hu. sc., Ligamentum humero-scapulare.
Liv., Liver.
Liv. d., Liver duct.
L. ovi., Left oviduct.
L. P., Lumbar pad or Lumbalwulst or sinus rhomboidalis.
Met., Musculus metapatagialis.
Mo., Medulla oblongata.
Nos., Nostril.
O. c., Occipital condyle.
Olf. l., Olfactory lobe.
Op. ch., Optic thalamus.
Pan., Pancreas.

Pan. d., Pancreatic duct.
Pars. hu. cub., Musculus pars humero-cubitalis.
Pars. hu. cubi., M. pars humero-cubitalis insertion.
Pars. sc. cub., M. pars scapuli cubitalis.
Pars. sc. cubo., M. pars scapuli cubitalis origin.
Pars. sc. cubi., M. pars scapuli cubitalis insertion.
P. c., Posterior commissure.
Pect., Musculus pectoralis, pars thoracica.
P. pat. l., M. propatagialis longus.
P. pat. b., M. propatagialis brevis.
Pn., Pineal eye.
Prov., Proventriculus.
R., Radius.
Rh. S., Musculus rhomboideus superficialis.
Rh. Si., M. rhomboideus superficialis insertion.
Rh. p., M. rhomboideus profundus.
Rh. pi., M. rhomboideus profundus insertion.
R. ovi., Right oviduct.
S., Musculus ilio-tibialis internus or sartorius.
Sc. hu. a., M. scapuli-humeralis anterior.
Sc. hu. ao., M. scapuli-humeralis anterior origin.
Sc. hu. ai., M. scapuli-humeralis anterior insertion.
Sc. hu. p., M. scapuli-humeralis posterior.
Sc. hu. po., M. scapuli-humeralis posterior origin.
Sc. hu. pi., M. scapuli-humeralis posterior insertion.
Sc., scapula.
S. c., Semicircular canals.
Ser. p., M. serratus profundus.
Ser. s. a., M. serratus superficialis anterior.
Ser. s. p., M. serratus superficialis posterior.
Sp., Spinal cord.
Sp. I., First spinal nerve.
Spl., Spleen.
S. Sc., Musculus subscapularis.
St., Sternum.
St. Co., Musculus sterno-coracoidus.
Sub. co., M. subcoracoideus.
Sub. coi., M. subcoracoideus insertion.
Sup. cor., M. supracoracoideus.
Sup. cori., M. supracoracoideus insertion.
Sup. cor. t., M. supracoracoideus tendon.
T., Tongue.
Ul., Ulna.

Ur., Ureter.
I., First cranial nerve.
II., Second cranial nerve.
III., Third cranial nerve.
IV., Fourth cranial nerve.
V., Fifth cranial nerve.
VI., Sixth cranial nerve.
VII., Seventh cranial nerve.
VIII., Eighth cranial nerve.
IX., Ninth cranial nerve.
X., Tenth cranial nerve.
XI., Eleventh cranial nerve.
XII., Twelfth cranial nerve.

All the figures are drawn from free hand sketches. Those of *Geococcyx* and *Bubo* are mostly drawn life size, and have been reduced one-half in the reproduction. Those of *Aeronautes* are mostly twice life size, some three times, and have been reduced one-third. In all cases the lateral view of the pecten of the eye is three times life size, and the view from the apex a little more than three times.

PLATE I.

Geococcyx californianus.

Fig. 1. Ventral view of the brain.
Fig. 2. Dorsal view of brain, with outline of head and nostrils.
Fig. 3. Brain viewed from left side.
Fig. 4. Dorsal view of sacral plexus.
Fig. 5. Lateral view of peeten of the eye.
Fig. 6. Peeten seen from its free apex.
Fig. 7. Median longi-section of brain.
Fig. 7a. Dorsal view of brachial plexus.
Fig. 8. Female excretory organs, ventral view.
Fig. 9. Female urogenital organs, ventral view.
Fig. 10. Dorsal view of tongue and glottis.
Fig. 11. Ventral view of the posterior portion of alimentary tract.
Fig. 12. Ventral view of internal nares and aperture of Eustachian tube.
Fig. 13. Dorsal view of duodenal loop and panereas.

PLATE II.

Geococcyx californianus.

Fig. 14. Superficial muscles of breast and inner arm.

Fig. 15. Superficial muscles of back and outer arm.
Fig. 16. Deeper muscles of breast and inner arm.
Fig. 17. View of shoulder muscles seen from the front to show the musculus deltoideus minor.
Fig. 18. Muscles of shoulder and chest.
Fig. 19. Deeper muscles of back.
Fig. 20. Muscles of upper arm.
Fig. 21. Ventral view of viscera.
Fig. 22. Ventral view of intestine, showing its convolutions. Parts separated for sake of clearness. The dotted lines represent the portion of the intestine covered by superficial folds.

PLATE III.

Bubo virginianus.

Fig. 23. Ventral view of posterior portion of alimentary tract.
Fig. 24. Dorsal view of liver, gall bladder and duodenum.
Fig. 25. Muscles of shoulder and chest.
Fig. 26. Muscles of wing.
Fig. 27. Ventral view of portion of the brain.
Fig. 28. Muscles of upper arm and other muscles inserting on it.
Fig. 29. Ventral view of viscera.

PLATE IV.

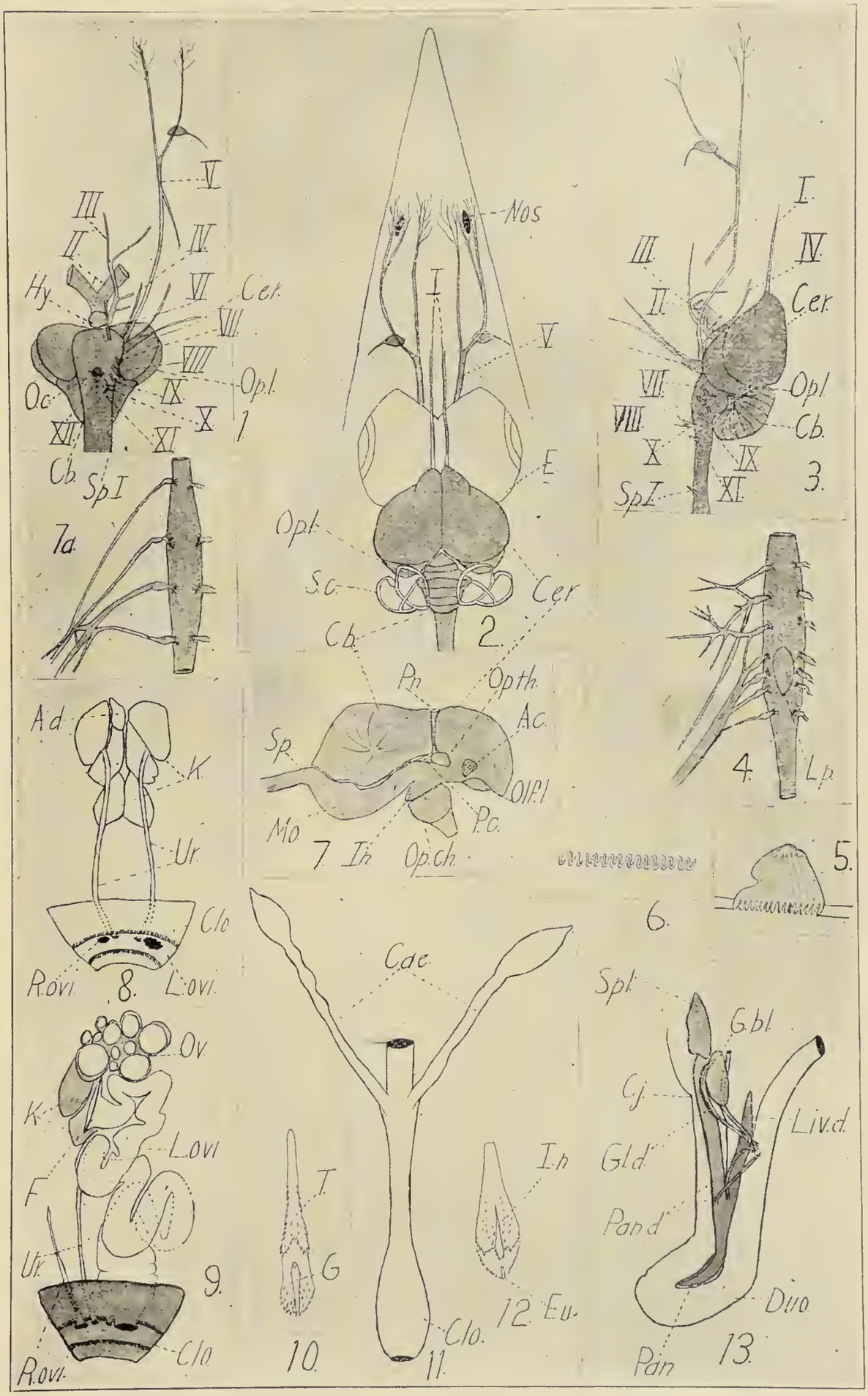
Bubo virginianus.

Fig. 30. Muscles of upper wing.
Fig. 31. Dorsal view of brachial plexus, anterior end turned towards left.
Fig. 32. Female urogenital organs, ventral view.
Fig. 33. Superficial muscles of back and outer wing.
Fig. 34. Dorsal view of floor of mouth.
Fig. 35. Pecten of the eye seen from its free apex.
Fig. 36. Lateral view of pecten.
Fig. 37. Superficial muscles of chest and inner wing.

PLATE V.

Aeronautes melanoleucus.

Fig. 38. Dorsal view of brain, with outline of head and nostrils.
Fig. 39. Brain viewed from left side.
Fig. 40. Ventral view of brain.
Fig. 41. Dorsal view of brachial plexus.



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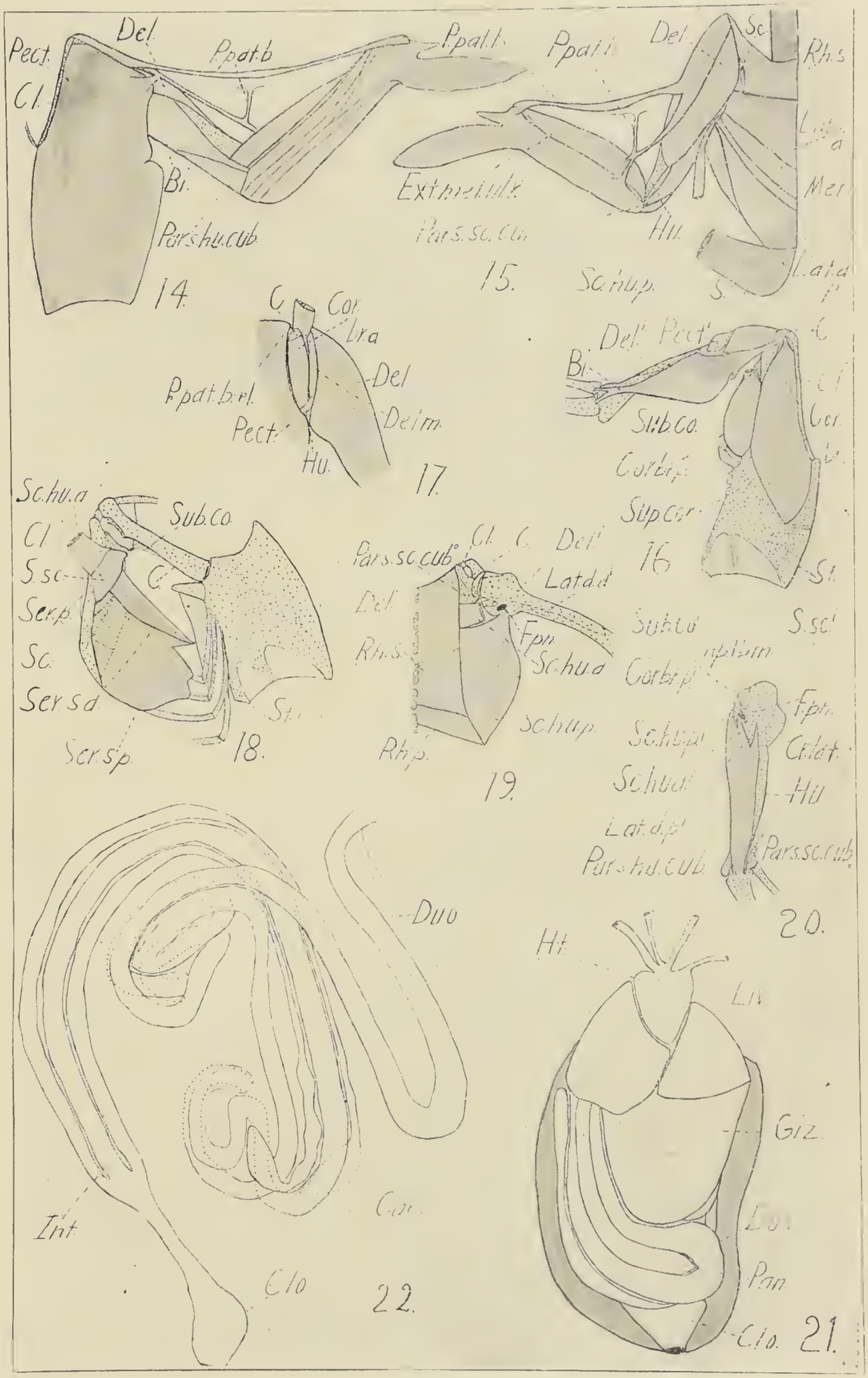

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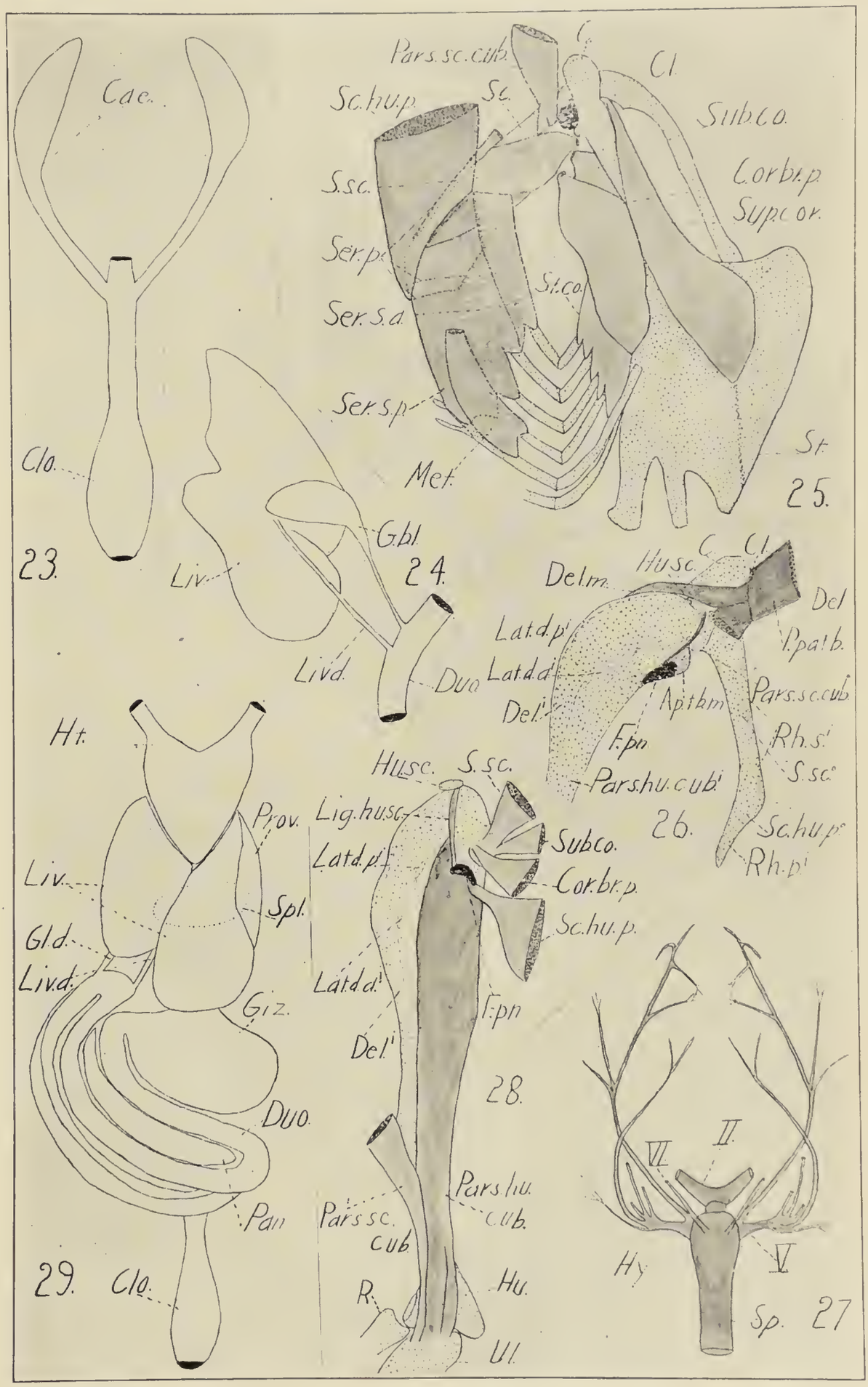

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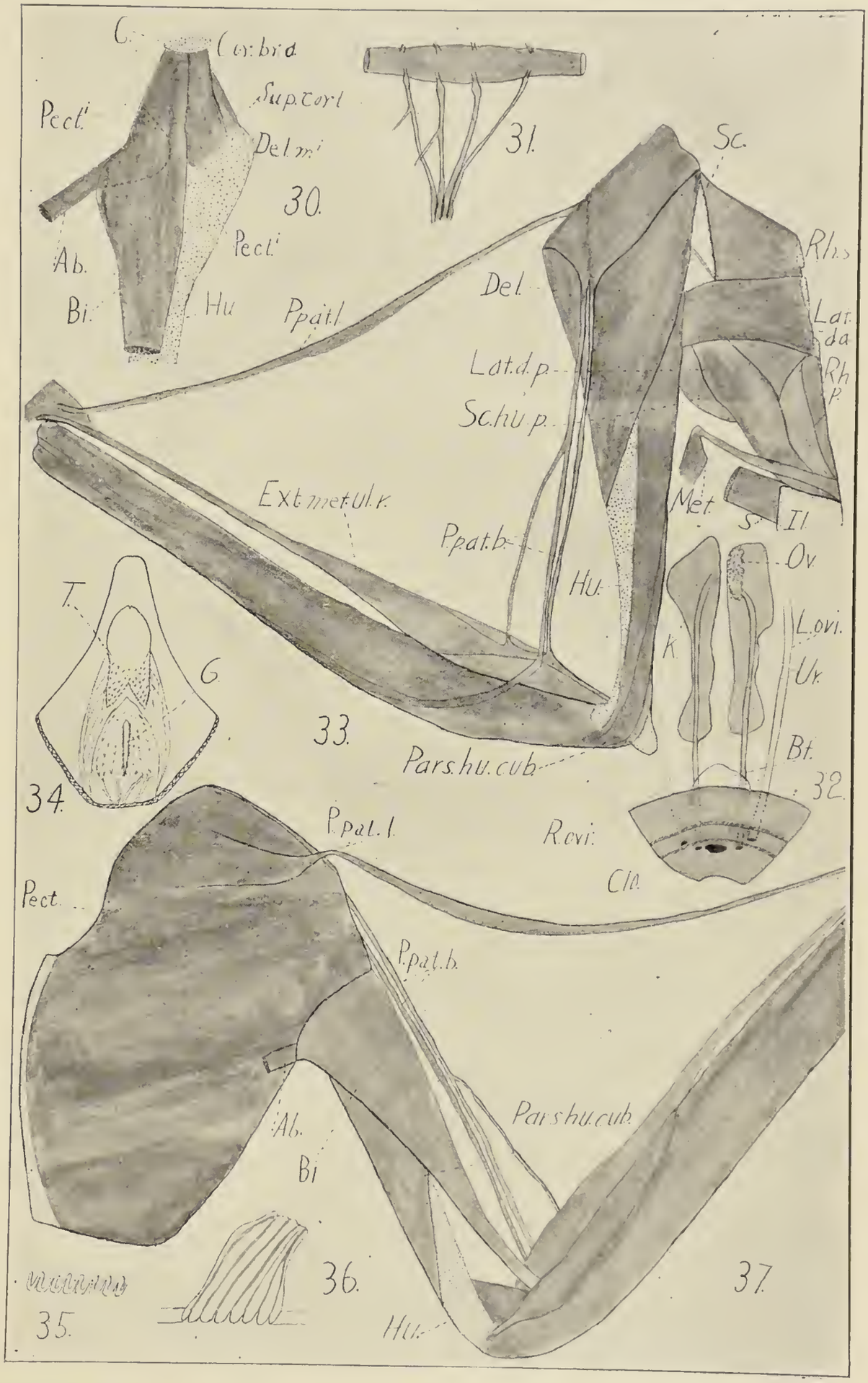

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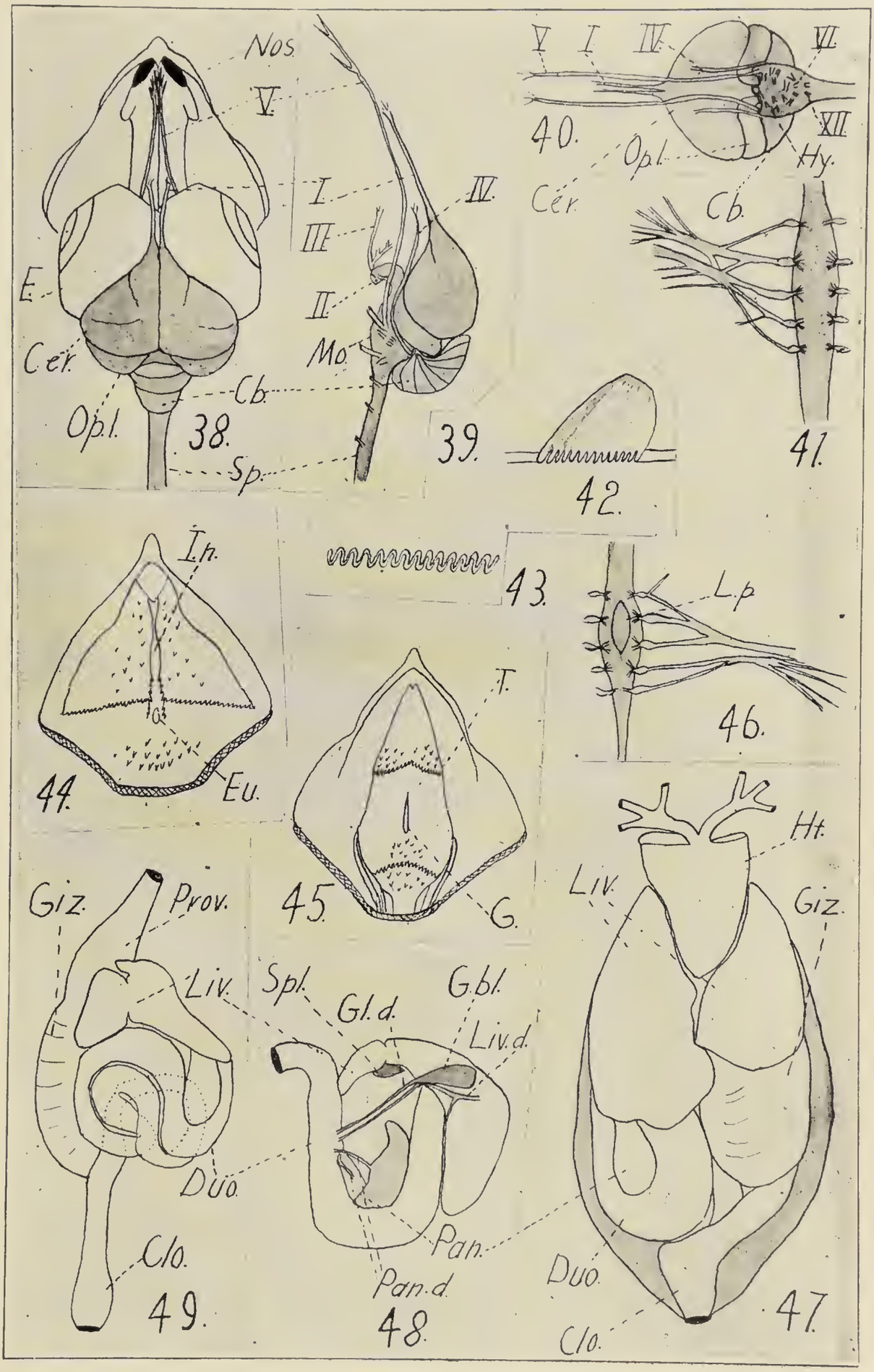

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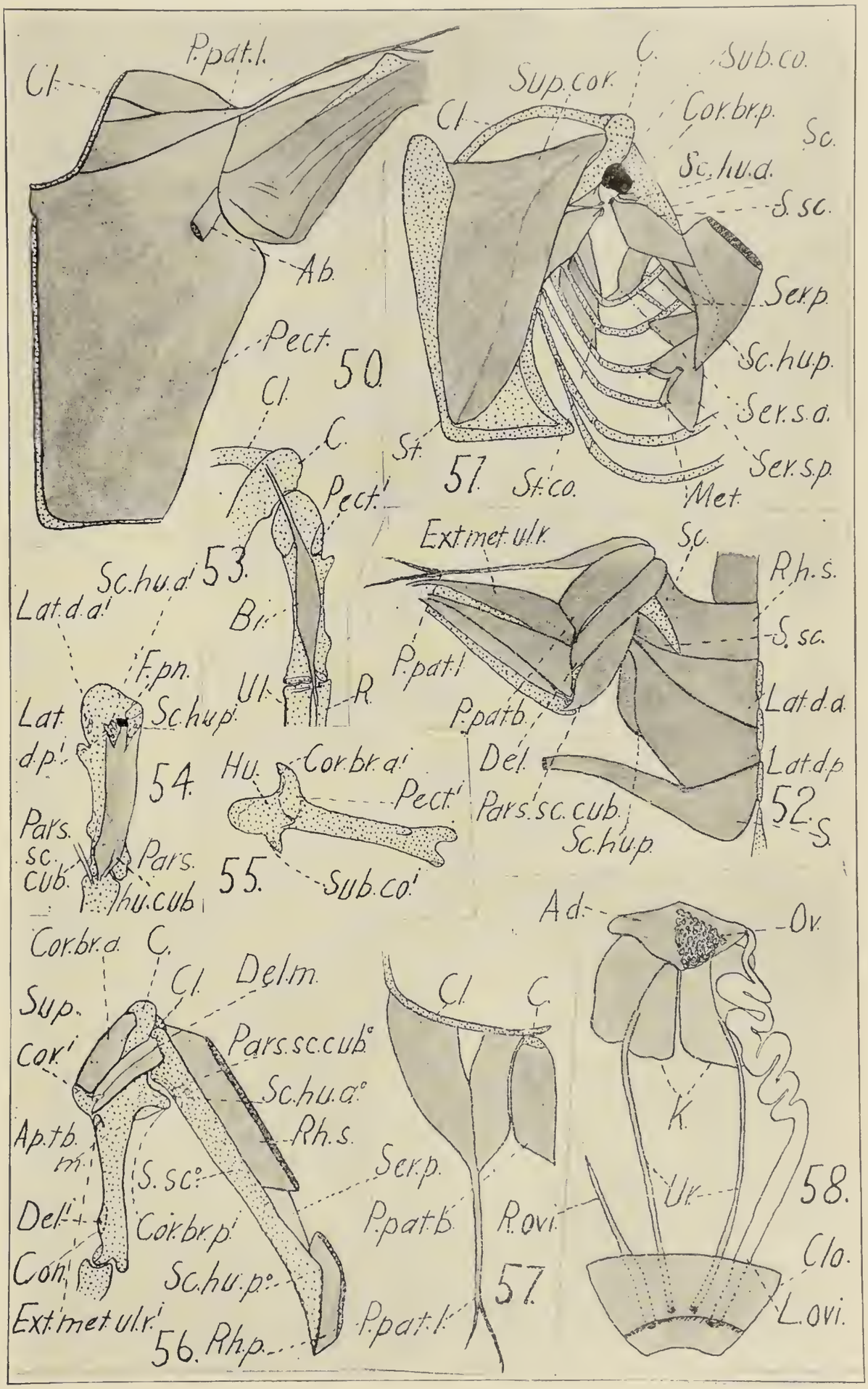

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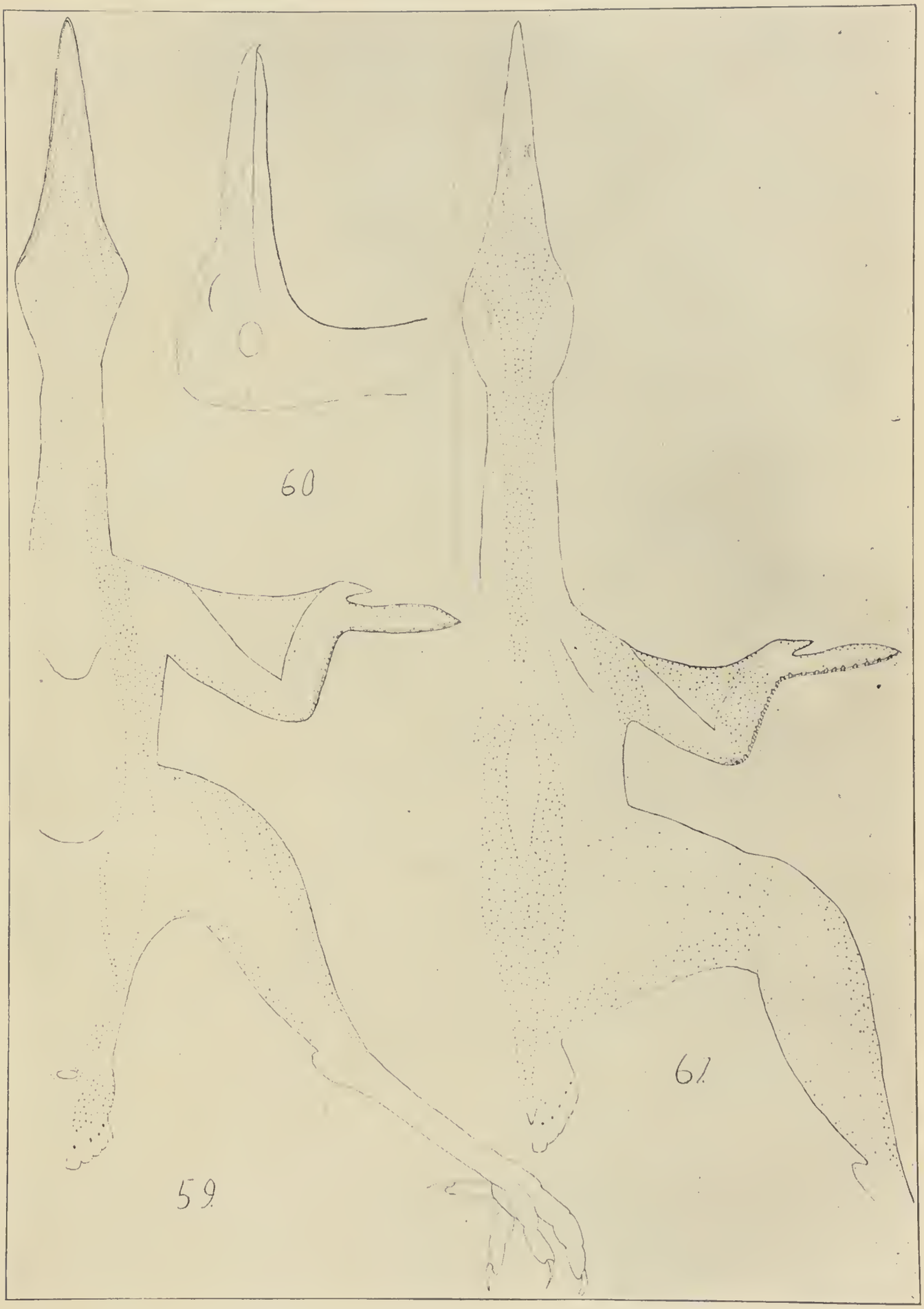

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Fig. 42. Lateral view of pecten of the eye.
Fig. 43. Pecten viewed from its free apex.
Fig. 44. Ventral view of roof of mouth.
Fig. 45. Dorsal view of floor of mouth.
Fig. 46. Dorsal view of sacral plexus.
Fig. 47. Ventral view of viscera.
Fig. 48. Postero-ventral view of viscera.
Fig. 49. Lateral view of viscera, showing intestinal convolutions. The dotted lines represent portions of the intestine covered by superficial folds.

PLATE VI.

Aeronautes melanoleucus.

Fig. 50. Superficial view of muscles of chest.
Fig. 51. Muscles of shoulder and chest.
Fig. 52. Superficial muscles of back and outer wing.
Fig. 53. Ventral view of left upper arm.
Fig. 54. Dorsal view of left upper arm.
Fig. 55. Median view of left upper arm.
Fig. 56. Muscles of wing and those of back inserting on it.
Fig. 57. Patagial muscles seen from the front.
Fig. 58. Female urogenital organs, ventral view.

PLATE VII.

Geococcyx californianus.

Fig. 59. Ventral view.
Fig. 60. Lateral view of head.
Fig. 61. Dorsal view.

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